TrafficGen: Learning to Generate Diverse and Realistic Traffic Scenarios

Abstract

Diverse and realistic traffic scenarios are crucial for evaluating the AI safety of autonomous driving systems in simulation. This work introduces a data-driven method called TrafficGen for traffic scenario generation. It learns from the fragmented human driving data collected in the real world and then generates realistic traffic scenarios. TrafficGen is an autoregressive neural generative model with an encoder-decoder architecture. In each autoregressive iteration, it first encodes the current traffic context with the attention mechanism and then decodes a vehicle's initial state followed by generating its long trajectory. We evaluate the trained model in terms of vehicle placement and trajectories, and the experimental result shows our method has substantial improvements over baselines for generating traffic scenarios. After training, TrafficGen can also augment existing traffic scenarios, by adding new vehicles and extending the fragmented trajectories. We further demonstrate that importing the generated scenarios into a simulator as an interactive training environment improves the performance and safety of a driving agent learned from reinforcement learning. Model and data are available at https://metadriverse.github.io/trafficgen.